

SCIENCE

FRIDAY, JULY 29, 1887.

WILL THE READER please cast his eye upon the following questions: 1. How can it be proved that nicotine is a poison? 2. Why are cigarettes especially harmful? 3. Is alcohol a food? 4. What is the effect of disuse upon a muscle? 5. Under what names is opium sold? 6. Under what names is alcohol drunk? 7. What is the difference between a food and a poison? 8. Is any thing gained by changing from one narcotic to another? 9. What is the effect of beer as a drink? 10. How does cheerfulness help the muscle? These are the questions given as a test in physiology in the public schools of a prominent Eastern city. They are not addressed to young men about to leave school. No, they are asked of little boys and girls of from eight to ten years of age. This is the examination-paper at the end of the first year's elementary instruction in physiology. Of ten questions, eight relate to drinking and smoking: the physiology is a mere side issue. These children, who ought to have about as much knowledge of such matters as they should of the methods in vogue at the stock exchange, are actually forced to learn by rote the details of human vice; and that, too, under the name of 'physiology,' the only science which they learn. Unconsciousness, *naïveté*, is the symbol of childhood. The fact that physiology, even if well taught, tends to destroy this trait, is the chief objection to its early study. Instruction such as the above implies crushes the most valuable trait in the child, directs its curiosity to what is morbid, and forces into precocious development all its dangerous elements. Not enough that the newspaper and the dime novel proclaim in glaring colors the story of crime and sin: some notion of the perversity of human nature must be mixed with the food of babes. That the result of this teaching is to excite in the children a morbid curiosity to experiment for themselves in such matters; or (with the boys) to regard the whole thing as a lesson in 'goody-goodyness,' to which they forthwith decide to show themselves superior; or to regard their father, who takes his glass of wine at dinner, as an incipient criminal,—this could easily have been foreseen, and goes without saying. If there is one method better than all others to produce a race of drunkards, this has good claims to that distinction. If there is a degree of wrong in such superlatively perverse methods, then it is still worse that the fair name of science should be outraged in this cause. Not only that this kind of teaching necessarily depends upon catechism methods (that the answer to the second question, for example, is to read that the especial perniciousness of cigarettes is due to the fact that they are usually made of decayed cigar-stumps), but that the entire idea of science thus implanted is as wrong as it well can be. Better far revert to the old days when there was no science on the curriculum than have science thus taught. The crowning educational virtue of science is that it leads to the use of scientific methods of teaching: this usurper chokes up all possibility of an interest in the scientific. The 'temperance' question is doubtless one of the most important with which our age has to deal; sufficiently important, perhaps, to make some consideration of it in the public schools a legitimate proceeding, but it must be done at the right time and in the proper way. Nothing can excuse the conversion of a text-book on physiology into a 'temperance' tract: nothing can excuse the sacrilege of presenting this story of disgusting vice under the name of 'science.'

THE STATEMENTS by Mr. W. Glenn in *Science* of July 15, as to the freedom from disease of men employed in the Baltimore sewers,

are of greater interest in view of the report of Professor Carnelley, D.Sc., and Mr. Haldane, of University College, Dundee, referred to in *Engineering* lately. These gentlemen have been investigating the impurities of sewer-air, and find that the organic acid in the sewers examined was about twice, and the organic matter three times, that of the outside air, whereas the number of micro-organisms was less. As regards the quantity of these three impurities, the air of the sewers was better than the air of naturally ventilated schools, while even mechanically ventilated schools were more polluted with organic matter. The sewer-air contained a much smaller number of micro-organisms than the air of any class of house, and the carbonic acid was rather greater than the air of houses of four rooms and upwards, but less than in two and one roomed houses. As regards organic matter, however, the sewer-air was only slightly better than the air of one-roomed houses, and much worse than that of other classes of houses. The amount of carbonic acid found by the observers shows that the sewers observed were better ventilated than those investigated by previous observers. They attribute the excess of carbonic acid over that of the outside air chiefly to oxidation of organic matter in the sewage and the air of the sewer. The excess of organic matter is probably chiefly gaseous, and derived from the sewage itself. The micro-organisms in sewer-air come entirely, or nearly so, from outside, and are not derived, or only so in relatively small numbers, from the sewer itself. This important conclusion is proved by the facts that the average number of micro-organisms in sewer-air was less than in the outside air, namely, as 9 to 16; that the number increased with the efficacy of the ventilation; that the average proportion of moulds to bacteria in sewer-air was almost exactly the same as in outside air at the same time, whereas one would expect the proportion to be very different were the outside air not the source from which they were derived, seeing that such a difference has been proved to exist in the air of houses and schools. Another consideration is that the filthiness of a sewer seems to have no influence on the number of micro-organisms. Further experiments in the laboratory showed that the number of micro-organisms in sewer-air is diminished nearly a half in passing along a moist tube 5 feet long and 1½ inches in diameter, at a rate of nearly 1 foot per second. There was, however, distinct evidence of the occasional dissemination of micro-organisms from the sewage itself; especially in splashing, owing to drains entering the sewers at points high up in the roofs. It is therefore important that drains should be arranged to avoid splashing.

TOPOGRAPHICAL SURVEY OF THE UNITED STATES.

IT is some eight years since the passage of the law creating the U. S. Geological Survey. This survey is charged, among other things, with making a geological map of the United States. For this purpose, it is desirable to have good maps for the use of the geologist in the field, and for the exhibition of results. No map of the whole country, suitable for the purpose, exists, and, of many and extensive portions, rude and imperfect diagrams constitute the only maps. The Geological Survey, therefore, first sought to have inaugurated a general topographical survey of the whole country.

The superintendent of the Coast and Geodetic Survey was conferred with and solicited to undertake the work, and a little work was actually undertaken, but none upon a general or comprehensive plan. The Geological Survey, therefore, finding that no satisfactory progress in geological work was possible without suitable maps, set about organizing topographic work on a systematic and comprehensive plan.

The plan of work, the scale to be adopted, the methods to be used with a view to efficiency, rapidity, and economy, were carefully considered, and then a plan was adopted, subject to such modifications as experience should suggest. Although this plan, and the progress of the work, have been set forth in various official documents, nevertheless they seem to be very little known.

It therefore appears desirable to set forth in brief and simple form the plan which the Geological Survey has, after mature consideration, adopted for making a topographic map of the United States, and the progress which has been made in the prosecution of the adopted plan.

It was decided to make a map which, although primarily designed for the use of the geological corps, should be upon such scales and should represent such features as to make it subserve all purposes to which a general topographic map is applicable, — in short, that it should be *the topographic map of the United States*.

The question of the scale or scales of the map is one of the utmost importance, as upon this depends, on the one hand, the degree of accuracy and the amount of detail necessary to be obtained in the survey, and, upon the other, the value of the map. It was seen at once that it would be inadvisable to attempt to make the maps of all parts of the country upon the same scale. The differences in degree of settlement, in material wealth, in the character of the prevalent industries, in the complexity of geological phenomena, and in the amount and degree of detail of the relief, all emphasize the desirability of varying the scale in different parts of the country.

A scale of 1 : 62,500, or about one mile to an inch, was adopted for the most populous regions, after a careful consideration of the requirements which such a map should meet, and with full knowledge of the experience of European nations in this matter. In the southern and central States, the conditions of settlement, the character of the industries, and other conditions, appear to admit the use of a smaller scale, and accordingly for this area the scale was fixed at 1 : 125,000 or about two miles to an inch.

In the sparsely settled region of the Rocky Mountain plateau, a still further reduction appeared advisable; and for this region, with the exception of certain small areas which for special reasons appeared to require a larger scale, it was fixed at 1 : 250,000, or about four miles to an inch.

The maps represent all natural features of drainage and relief, in degree of detail proportioned to the scale. They represent all *public* culture, i. e., all such of the works of man as have relation to communities as distinguished from individuals. This excludes, it is true, a large part of the culture, but the portion excluded seems for various reasons to be out of place upon such a map. It is of little general interest; it is evanescent, much of it to such a degree that by the time the map is published it would be incorrect and misleading. Its adoption would require the use of a large number of arbitrary symbols, which would be unintelligible without an extensive legend upon each sheet; and, furthermore, the inclusion of so large an amount of cultural material would serve to confuse the map and render its more important parts illegible.

Relief is expressed by contours. The contour-interval, or, as it may be designated, the vertical scale, is adjusted to the horizontal scale, and to the degree of relief of the country. It ranges from 10 to 200 feet; the smallest contour-interval accompanying the largest scale, and *vice versa*.

The size of sheets is so arranged that each sheet upon the smallest scale comprises a square degree, i. e., a degree of latitude by a degree of longitude. Upon the scale of 1 : 125,000, each sheet is 30 minutes in each dimension, and upon the scale of 1 : 62,500, each sheet is 15 minutes in each dimension.

The field-work of the survey is carried on with direct reference to the scale of publication. The accuracy, the amount of geometric control, and the degree of detail of the sketching, are proportioned to this scale. A greater degree of accuracy than is required is undesirable, on account of the increased cost. A greater degree of detail in the sketching than is demanded by the scale is not only useless, but worse than useless, as it involves generalization in the office in order to adapt it to the scale, and such generalization cannot be as satisfactory as if made in the field.

For convenience, the original maps and the plane-table sheets are usually made upon scales larger than those of publication. The following table shows the scales in use for the original platting of the maps, the scales of publication, and the contour-intervals, together with the areas surveyed in 1886, in the several areas of work:—

	Field-Scale.	Publication-Scale.	Contour-Interval.	Area surveyed in 1886.
Massachusetts.....	1 : 30,000	1 : 62,500	20 and 40	3,359
New Jersey.....	1 : 20,000	1 : 62,500	10 and 20	1,400
District of Columbia.....	1 : 30,000	1 : 62,500	20	275
Appalachian	1 : 126,720	1 : 125,000	100	19,054
Kansas.....	1 : 63,360	1 : 125,000	50	6,000
Missouri.....	1 : 63,360	1 : 125,000	50	4,450
Texas.....	1 : 126,720	1 : 125,000	50	4,388
Arizona.....	1 : 126,720	1 : 250,000	100	7,800
California	1 : 63,360	1 : 125,000	200	3,025
Oregon.....	1 : 126,720	1 : 250,000	200	3,000
Montana.....	1 : 126,720	1 : 250,000	200	3,300
Total.....				56,051

At the close of the year 1886, areas amounting to 250,000 square miles, or about one-fourteenth of the area of the country, including Alaska, had been surveyed.

This work is carried on by a Division of Geography, having a *personnel* numbering about one hundred permanent employees besides the temporary aids and camp hands employed during the field-season. The organization of the division during the field-season of 1886 was as follows:—

Sections.	Sub-sections.	Parties.	No. men.
North-eastern.....	{ Massachusetts..... New Jersey..... Dist. of Columbia.....	{ 4 topographic..... 1 topographic..... 1 topographic.....	{ 37 11 2
Appalachian.....	{	{ 7 topographic 1 triangulation }	{ } 58
Central.....	{ Kansas..... Missouri.....	{ 1 topographic 1 triangulation 1 topographic }	{ } 10 5
Western	{ Texas..... Arizona..... California..... Oregon..... Montana.....	{ 1 triangulation 2 topographic 1 topographic and triangulation 1 triangulation 2 topographic 2 topographic and triangulation 1 triangulation 2 topographic }	{ } 11 5 7 6 8

The names given to the sub-sections indicate the fields of work, and the number of men includes permanent assistants and temporary aids, but not laboring force. The work is everywhere controlled by triangulation. Topographic work is prosecuted in part by plane-table, using it by the method of intersections and by traverse methods. Both these methods are in use in Massachusetts. The work in the western part of the State is done entirely by plane-table; that in the wooded, level country in the south-east, by traverse, using the compass for direction and the telemeter for distance, elevations being measured by the vertical circle and by the Y-level. In the north-east the two methods are combined to good advantage, the work of the plane-table being supplemented by telemeter traverses. In New Jersey the survey is made in plan by traverse, with the compass and odometer. The vertical element is subsequently added by Y-level. In the area adjacent to the District of Columbia, the survey is made by telemeter traverse. In the Appalachian Mountain region, south of Mason and Dixon's line, the triangulation rests upon the Appalachian belt of the U. S. Coast and Geodetic Survey. The topographic work is in part done by the plane-table, or the kindred method with the theodolite, but mainly by traverse with compass and odometer. Elevations are determined by barometer and the vertical circle.

In Missouri and Kansas the work is greatly expedited by the

use of the rectangular surveys of the General Land Office, which extend over this region. The township-plats supply more or less fully the drainage, and, in addition to this, they cover the ground with located points, the township, section, and quarter-section corners. Furthermore, throughout the settled portions of Kansas, and in the greater portion of Missouri, the roads, fences, hedges, etc., mark the lines of subdivision in such a manner that the country is graphically subdivided, and the location of features horizontally becomes simply a matter of sketching. In Kansas these lines of subdivision are controlled by belts of triangulation, which, starting from lines of the transcontinental belt of the Coast and Geodetic Survey, run westward, midway between parallels of latitude. In Missouri the work is controlled by the transcontinental belt of the Coast and Geodetic Survey. Each triangulation point is connected with the nearest township or section corner. The topographic work consists in the verification of the drainage of the Land Office plats, in supplementing it wherever necessary, and in adding the culture and relief. Heights are measured by barometer, and the profiles of railroads are utilized.

The work in the various fields of the Western section is carried on by methods quite similar to one another. The triangulation in Texas rests upon a base-line, measured near Austin, and the Coast and Geodetic Survey's determination of that city furnishes the initial astronomical location. The triangulation in Arizona, with that of a considerable area adjacent to it in New Mexico, Utah, and Nevada, starts from a base near Fort Wingate, N. Mex., and rests upon the astronomic determination of that place. The triangulation in Oregon and California rests upon lines furnished by the Coast and Geodetic Survey; while that in Montana rests upon a base measured near Bozeman, and upon the astronomical determination of that place made by the Wheeler Survey. The topographic work of this section is done by plane-table, supplemented in greater or less degree by traverses. The plane-table work is regarded, however, as a sketch, and, coincidently with it, a secondary triangulation is carried on with theodolites, which, when platted, serves to correct the plane-table sketch. Heights are measured with the barometer and the vertical circle.

The quality of the work is to be measured first by the accuracy of the geometric control; second, by its quantity, i. e., by the number of located points per square inch of map-surface; third, by the distribution of these points; and, fourth, by the quality of the sketching, by which the geometric skeleton is filled out into the proportions of the map. The angles in the primary triangulation are read by instruments having circles 6 to 11 inches in diameter, reading to 5 or 10 seconds. The mean closure errors in the various sections are as follows:—

Appalachian.....	16.00
Kansas.....	6.60
Texas.....	6.13
Arizona.....	9.05
California.....	20.39
Oregon.....	22.04
Montana.....	15.63

Within this primary work, a secondary system is usually carried on, with minute-reading theodolites; and, resting upon these locations, large numbers of minor points are determined by the plane-table, or by traverse, coincidently with the sketching of topography. Thus as the lines to be determined become shorter, and the probability of an accumulation of error less, the means provided for their measurement are proportionately less accurate, until, in the ultimate work,—that of sketching,—the only means of measurement are the eye and hand of the topographer. It does not follow from this, however, that any part of the geometric work is in appreciable error. It is required that all location shall be sensibly accurate *upon the map*, and this condition is everywhere fulfilled.

Second, the number of located points, or the amount of geometric control, varies with the character of the country. The number of such points is necessarily greater in a country of high relief than in one of low, rolling hills; it is greater in a country of small, abrupt features than in one of large features; it is greater in a well-settled country, containing many cultural features, than in an unsettled one. Consequently, in this regard, the work done in different areas varies greatly, as will be seen by the following table,

relating to the work of 1886. This shows the number in each square inch of map of occupied points, of points located by angles, of inches of traverse line, and of traverse stations:—

	Triangulation Stations per sq. in.	Triang. Stations and Locations per sq. in.	Inches of Traverse per sq. in.	Traverse Stations per sq. in.
Massachusetts, Plane-table work.....	1	6.5	—	—
“ Traverse work.....	—	—	2.8	24
“ Mixed work.....	0.3	1.7	2.6	10
New Jersey.....	—	—	2.2	21
Dist. of Columbia, and vicinity.....	—	—	2.5	9
Appalachian region.....	0.1	0.3	1.4	30
Missouri.....	—	—	1.7	—
Kansas.....	—	—	0.7	—
Texas.....	0.1	0.25	0.9	9
Arizona.....	0.2	1.2	1.1	2
California.....	0.3	4	1.4	12
Oregon.....	0.3	4	1.3	5
Montana.....	0.25	3.2	—	—

In the above table the points located by the two methods of intersection and traverse are given separately. This has been done because they differ in value. Those made by intersection are

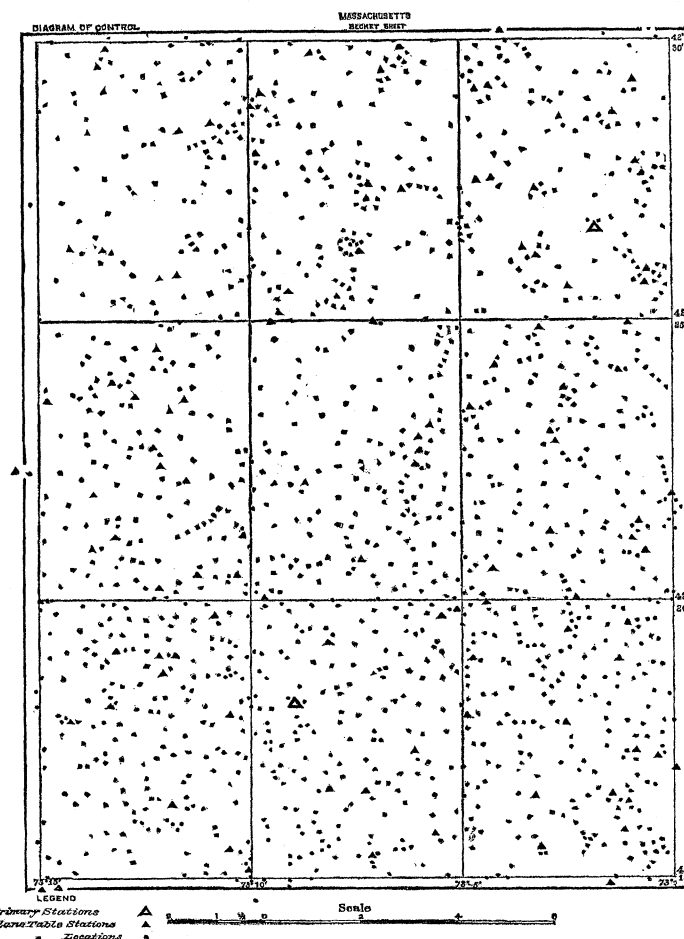


FIG. 1.

selected points, chosen because of their value in controlling area, while of the traverse locations a large proportion have no value whatever except for the purpose of carrying forward the line, and

comparatively few of them would be selected as key points for location purposes. Even with this qualification, caution is needful in making comparisons between different pieces of work. The undulating, sparsely settled Texas area, and the monotonous plateaus of Arizona, must not be contrasted with western Massachusetts, where abrupt hills and an abundance of cultural features require a large number of locations, and render it practicable to make them.

Third, the distribution of locations is a matter of no less importance than their number. To illustrate the degree of uniformity of their distribution, the following cuts are presented. Fig. 1 represents the geometric control of an atlas sheet, from the plane-table work of Massachusetts; and Fig. 2, a sheet from the traverse work in the same State; the lines representing the lines of traverse, and the triangles the triangulation points which serve to check the traverses. Fig. 3 represents the control of an Appalachian sheet, showing triangulation stations, locations by intersections, and traverse lines. It will be seen that the distribution is quite uniform. It will

or less idealized. No two men will generalize an area of country, to adapt it to the scale, in precisely the same way. Some will generalize more, others less; some will omit this feature, others that; and they will merge minor features in various ways. The smaller the scale, the greater is the generalization, and, consequently, the greater room for differences in the work of different topographers.

The cost of the work is influenced by a great variety of conditions, the principal of which are the following:—

a. The Scale. Other conditions being similar, the cost increases with the scale, at a rate somewhat less than a geometric ratio, i.e., if the scale be doubled, the cost is somewhat less than four times as great.

b. The character and amount of the relief, drainage, and culture. The greater the relief, and the greater its detail, the more the work will cost. Work in a thickly settled country, containing many settlements, roads, etc., necessarily costs more than that in one of sparse settlement.

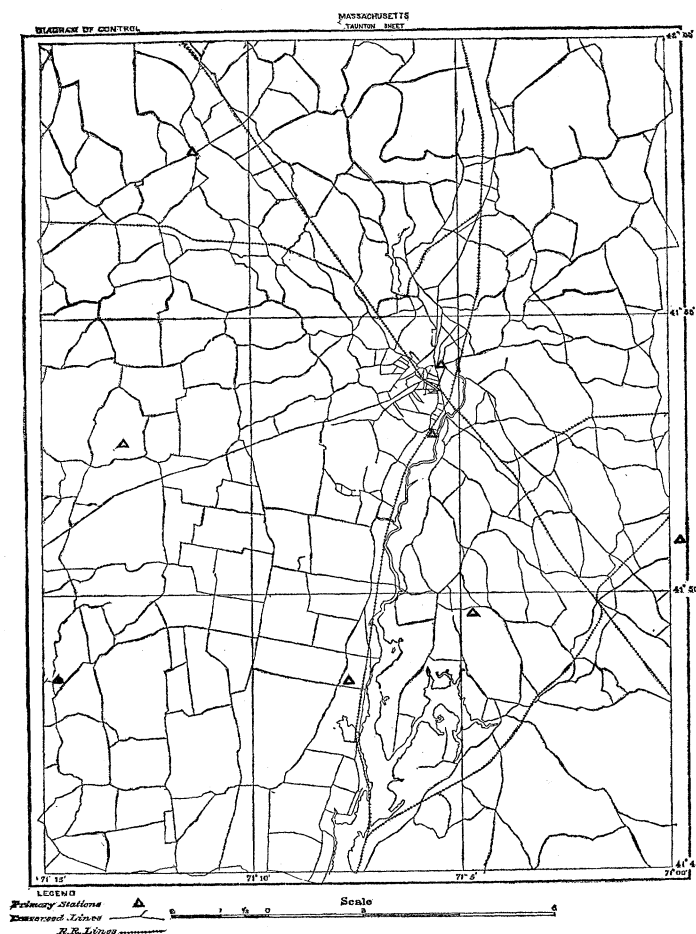


FIG. 2.

be noticed, further, that in a country composed of an alternation of mountain and valley, as the Appalachian region, most of the locations by intersections are upon the mountain ranges, while the traverse lines are mainly found in the valleys.

Fourth, concerning the quality of the sketching, little can be said. There are no means of verifying this work, except by an examination of it on the ground. It is in this part of the work more than any other that the personality of the topographer appears. It is here that his artistic sense, and his power of making his pencil record faithfully his conceptions, comes into play. It is scarcely necessary to add that no two topographers will sketch an area precisely the same. There will be differences in seeing, and differences in drawing, just as there are differences in handwriting. Every map, whatever its scale, is a reduction from nature. This reduction necessarily implies a certain amount of generalization. Certain features must be omitted, others merged into larger features, so that no map is or can be an exact miniature. Every map is more

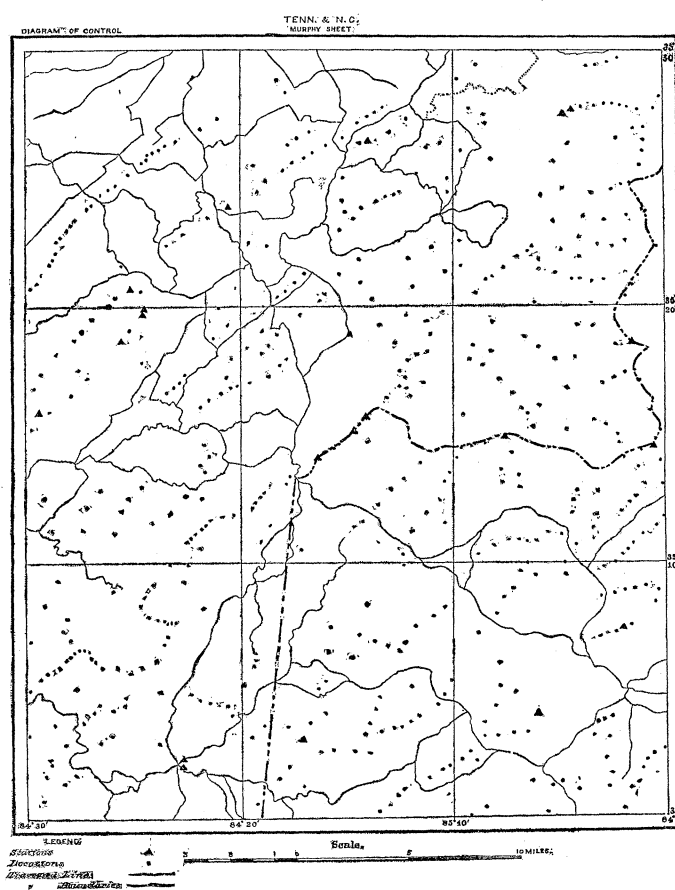


FIG. 3.

c. The degree in which a country is covered with forests. This element not only interposes obstacles and causes delays in the prosecution of work, but often necessitates the adoption of slower and more expensive methods of work.

d. Atmospheric conditions. This includes stormy weather, haze and smoke, which, being especially prevalent during the field-season in some localities, unduly increase the cost of the work.

e. Length of field-season. At the opening of each field-season, it is necessary to devote some time and money to outfitting the parties and starting field-work. This is in the nature of a plant or investment for the season. Once at work, the expense is not great. It costs little more to keep a party in the field for six months than for three months, while the amount of work done by the party is doubled. Therefore, long field-seasons are more economical than short ones.

The following table shows the cost of the work in the several areas under survey, including field and office expenses:—

Area.	Scale.	Cost per sq. mi.	Remarks.
Massachusetts.....	1:62500	12.00	Includes no primary triangulation.
New Jersey.....	1:62500	6.50	Includes some triangulation.
Dist. of Columbia.....	1:62500	7.30	Includes no primary triangulation.
Appalachian region.....	1:125000	3.00	
Missouri, Kansas.....	1:125000	.90	Aided greatly by land surveys.
Texas.....	1:125000	2.00	
Arizona.....	1:250000	1.00	
California.....	1:125000	3.00	
Oregon.....	1:250000	3.40	
Montana.....	1:250000	2.00	

The sheets, as completed, are engraved upon copper. For each sheet, three copper plates are used. Upon one is engraved all the drainage; upon another, the contours, expressing the relief; and upon the third, all culture and lettering. In printing, colors are used, — blue for drainage, brown for contours, and black for culture and lettering. At the present date, 120 sheets have been engraved, comprising an area of 250,000 square miles, parts of which were surveyed by the Powell Survey of the Rocky Mountain Region, by the Wheeler Survey, and by the Northern Transcontinental Survey.

HENRY GANNETT.

AMERICAN NEUROLOGICAL ASSOCIATION.

THE thirteenth annual meeting of the American Neurological Association was held at Long Branch on July 20–22. The president of the meeting, Dr. L. C. Gray of Brooklyn, in his opening address, reviewed the position of the study of neurology in this country as compared with European lands. America does not at all suffer by the comparison. In the movement which in the past twenty-five years has raised neurology to a science, the names of American workers are prominent, and the number of societies specially devoted to its interest is as large as in any other country.

The recent advance in our knowledge of the functions and diseases of the central nervous system is hardly appreciated, except by such as can remember how things stood twenty years ago. A medical student, who, in 1869, would have stated that the stimulation of the cortex of the brain would give rise to definite movements, would certainly not have received his degree; while the student of 1870, who would not have mentioned this fact, would have stood in equal danger. The amount of research, with a variety of ingeniously devised methods, that has been expended since then upon the localization of function in the cortex of the brain, is an excellent example of the great activity now current in neurological problems. In every direction — in the improvement of apparatus for diagnostic purposes, in the application of therapeutic agencies, in the rational care of the insane — have there been rapid strides, demonstrating beyond a doubt the important function of a neurological association.

The number and quality of the papers presented gave evidence of the increasing attention which the study of nervous diseases is here gaining. Dr. B. Sachs gave an interesting account of a case of arrested cerebral development. It was that of a child with hereditary predisposition to insanity, who lived for two years without exhibiting any but the most rudimentary signs of intelligence. It was listless, inactive, never learned to speak, and in its last period became blind. On examining the brain, the surface appearance was noteworthy. The left island of Reil — a group of cortical matter specially related to the faculty of speech — was exposed. In a normal child it would have been folded inwards, and an abnormal deviation accounts for the failure to develop speech. Many of the fissures flowed together which normally should be separate, — a mark of low-type and undeveloped brains. A microscopic examination showed that the pyramidal cells of the cortex, whose function (in parts of the cortex) is specially connected with motion, were abnormal; their positions were reversed, the nucleus faded, and the processes poorly developed. Outside the cells the appearance was normal. Dr. Sachs considered that the case was one of pure

arrested development, the brain having grown to a certain stage in the development, and then degenerative processes set in.

Dr. C. L. Dana recounted the remarkable history of a simple, chronic, neuræsthenic tremor in a certain family. This tremor is present in three generations, and has attacked forty-four members of the family. The original member thus affected has had the tremor for seventy years: he can momentarily control it, and any excitement increases its intensity, as well as affects the clearness of his speech. He is a watchmaker by profession, and very skilfully controls the shaking at the instant when his hand must be steady. The tremor ceases in sleep, and his walk and posture are normal. The hereditary history is unusually interesting. His grandfather was intemperate, his father insane, his nine children all have the tremor to a greater or less degree, and some are mentally peculiar. Seven of these children married and produced thirty-four children, all of whom have the same tremor, and the other peculiarities still remain. There are evidences that the tremor, though present, is dying out in the third generation. It is noteworthy that an adherence to Spiritualism is hereditary in the same family.

Dr. Gray called attention to the serious aspects of chorea. This disease is often treated less seriously than it merits. The majority of cases occur in children between eight and twelve years of age, and frequently the attacks are slight and readily outgrown. The cases which the physician should regard with greatest anxiety are those in which convulsions occur, in which there occur spasms of the respiratory apparatus, in which there is hysteria or cardiac or pulmonary weakness. The essential part of the treatment is complete rest, the exercising of the muscles having a hurtful influence.

Dr. Spitzka called attention to the severe injuries which the brain of dogs could undergo with impunity, and to the obliteration in vigorous animals of the injury done by needles forced into the brain. There are great individual differences between dogs in this respect, and a dog once operated upon seemed better able to endure a second operation. These experiments seemed to justify the piercing of the brain in surgical operations.

Dr. J. H. Lloyd cited a typical case in the peculiar borderland of insanity known as the 'insanity of doubt.' The patient has a morbid impulse to do things over and over again, for fear they are not done exactly right. She gets in and out of bed twenty times, until she does it just so. She sends her husband down at night to light and extinguish a gas-burner in a definite way, and cannot rest until it is properly accomplished; otherwise she is perfectly rational, recognizes the nature of her weakness, but cannot resist it.

A very valuable contribution was that by Dr. C. L. Dana, describing a case of anencephalus. An apparently normal, healthy child lived for two and one-half days: it cried very little, at times opened its eyes, and re-acted to reflex stimulation. On opening the skull the cerebrum was seen to be entirely absent, there being nothing above the corpora quadrigemina except a not well-developed thalamus. Such cases are rare, and are valuable for the light they shed on the connections between the spinal cord and the brain. The cerebrum being absent, all such systems of fibres as connect it with lower centres are absent. Prominent amongst these is the pyramidal tract, which conducts voluntary movements, and these were entirely absent. The sensory columns of the cord were intact, as were also the cerebellum and the cranial nerves, except, of course, the olfactory nerves. The value of such a case is the independent testimony it affords to the correctness of the sensory and motor fibre-systems as deduced by other methods.

Amongst the other papers read was one by Dr. Ott, urging on experimental evidence the existence of heat-centres in the spinal cord; by Dr. Dercum, describing two cases of chorea limited to one-half the body and accompanied by Bright's disease; by Dr. Spitzka, carefully delineating the symptoms of acute delirium; by Dr. Mills, aiming to ascertain a distinctive symptom between polio-myelitis and multiple neuritis; by Dr. Putnam, on a case of overgrowth of the skull bones; by Dr. Hun, on the symptoms accompanying a tumor of the pons; by Dr. Jacoby, urging the treatment of neuralgia by sprays of extreme cold; and by Dr. Kellogg, on the effect of baths in mental disease.

The limit of membership was increased to one hundred, and Dr. W. A. Hammond was elected an honorary member. The president for next year will be Dr. J. J. Putnam of Boston.

far south. Ndoruma wished him to remain some time at his village, and therefore Junker resolved to set up a station there for the coming months. With the help of Ndoruma's people, who were despatched to the work by hundreds, he was able to erect good substantial dwellings, which were surrounded by a high stockade to keep off the leopards which abound in this country. He staid here until August, when he left his companion, Bohndorff, in charge of the station, while he travelled south with only twenty bearers. He crossed the Welle and traversed the land of the Mangbatu, where he made friendship with the chief Mambango, and returned in December to Ndoruma. But as the best season for travelling had approached, he did not rest, but started in January, 1881, by a new road to the south-west, the country of the A-Madi, crossed the Welle there again, and obtained, though with the greatest difficulty, the necessary number of bearers among the A-Barambo; these, however, robbed him of part of his goods; and it was only with the help of Sasa, a friendly Niam-Niam chief, that he safely returned to the A-Madi country north of the Welle. At the end of April he sent Bohndorff with the baggage, under the care of Sasa, into the latter's country south of the Mbomo, where he was to establish another permanent station. In the mean time war had broken out between the Mangbatu and Emin Bey, the governor of the Equatorial Province, but by Junker's mediation further hostilities were prevented. This, however, detained him until the end of November, 1881. Then he made another start, and was almost uninterruptedly on the way up to June, 1882, exploring the region south of the Welle and Bomokandi. He was kindly received by the Niam-Niam chiefs Bakangai and Kana, whose villages are situated south of the Bomokandi, whence he turned north and reached Semio, north of the Mbomo, where his station had been meanwhile established, in September, 1882. Here he had the misfortune to lose a great part of his valuable property by fire. Bohndorff, who had frequently been sick, wished to return to Europe, and therefore Junker packed his collections and sent him to the Bar-el-Gasal Province, where, in the mean while, Lupton Bey had become governor. But at this time the Dinka tribes revolted against the Egyptian Government; and thus Bohndorff, being unable to reach Meshra-er-Rek, was compelled to return to Semio. This was in October, 1882, the commencement of long and bloody wars in the Bar-el-Gasal territory, on which finally the invasion of the Mahdi's troops followed.

Before Bohndorff's return, Junker had started on an extensive journey west. He reached the Welle, near the mouth of the Werre and Mbima, and traversed the territory of the Bandjia, who, though speaking a dialect of the Niam-Niam language, pretend to be of an independent descent. The islands of the Welle are inhabited by the A-Basango, who speak a distinct language. After having reached Ali-Kobo, he turned north, crossed the Mbomo, ascended the Shinko, and returned to Semio by way of Mbanga. He arrived on May 1, 1883.

He now regarded his travels as finished, and intended to start for the Bar-el-Gasal, where Bohndorff had gone a short time before, as Lupton Bey hoped that the route to Meshra-er-Rek would be open. But, although Lupton called in all the outlying garrisons on the Welle, he did not succeed in putting down the Dinka, who afterwards were joined by the Nuer, Agar, and other tribes. This war lasted eighteen months, and was far more bloody and exhausting for both parties than the later engagements against the troops of the Mahdi in Emin Pacha's province. Finally the Dinka were supported by the Mahdi's forces; and Lupton, betrayed by those about him, was compelled to deliver his province without resistance to the emissary of the Mahdi, Emir Karm Allah. Junker says that the chief cause of this surrender is to be sought in the fact that Lupton had almost exclusively irregular troops at his disposal, consisting of Dongola people and Arabs of all kinds. In October, 1883, the state of Lupton's troops was very precarious, and he sent a letter to Junker entreating him to persuade the chief Semio to collect about a thousand of his people with spear and shield, as well as all those who had guns, and come to his help. He said, "I now see no other way of putting down the insurrection than by the help of the Niam-Niam chiefs. Do every thing in your power to persuade Semio to lose no time, and send him to meet me as soon as possible."

As Junker saw the routes north closed, he resolved to go east to Lado. He left Semio in November, 1883, and reached Emin at Lado in January, 1884, after fifty-five days' march. During this time Bohndorff was able to reach Khartum with the steamer, returning thither at the end of December, but all collections remained behind.

Emin Pacha's province had been quiet up to the first months of 1884; but the successes of the Dinka were too tempting for the other negro tribes, and so in the Equatorial Province the rebellion assumed more formidable proportions. Emin was compelled to give up all stations east of the Nile and to concentrate his troops. On the 27th of May he and Junker received letters from Lupton Bey and Emir Karm Allah, which contained the news that the province had fallen into the hands of the Mahdi, and the demand to surrender the Equatorial Province. Emin answered the Emir's letter, saying that he was ready to deliver the province into the hands of the representative of the Mahdi in order to prevent useless bloodshed, and till his arrival he would try to hold the province for the Mahdi. Meanwhile a defence was organized, and the outlying stations were called in. But it was not until January, 1885, that the troops of the Mahdi attacked Emin's province. After they had taken the station Amadi in April of the same year, they retreated, for unknown reasons, by forced marches, to the Bar-el-Gasal region. Since that time Emin's province has been unmolested by the troops of the Mahdi. On Jan. 2, 1886, Junker left Emin Pacha and Casati, going south. He crossed the Mvutan Nsige to Kibiro, and went to Kabrega, king of Unyoro. Here he learned by letters from Zanzibar of the events in the Sudan, of King Mwanga's hostility towards the Europeans, and of Dr. Fischer's unsuccessful expedition sent out by Junker's brother to seek him. In the mean time war had broken out between the Waganda and Wanyoro, and it was not until June that he received permission to enter Mwanga's capital. It took him a month and a half to cross the Victoria Nyanza; and at last Tabora was reached, whence he proceeded with one of Tip-po-Tip's caravans to Zanzibar.

Thus his eventful wanderings in Central Africa were ended. It is hardly necessary to mention the importance of his explorations, which cover a large area, and of his interesting observations on the tribes with whom he lived for so long a time. The loss of his large collections will be regretted by naturalists and ethnologists, but nevertheless we should be glad that the enterprising traveller succeeded in extricating himself from the innumerable dangers and difficulties surrounding him.

BOOK - REVIEWS.

Report of the Committee on Disinfectants, of the American Public Health Association. Concord, N.H., Republ. Pr. Assoc. 8°.

THE report of the committee on disinfectants, of the American Public Health Association, presented at the Toronto meeting in October last, has just been printed. It deals with the various apparatuses now in use in this country and Europe for disinfection by means of heat, and is abundantly illustrated. The experiments of this committee have demonstrated that the most efficient non-destructive disinfectants are, (1) steam under pressure at 110° C. (230° F.) for ten minutes, (2) dry heat at 110° C. (230° F.) for two hours (in the absence of spores), (3) boiling in water for one-half to one hour. It will be seen from this that the apparatus for disinfection by heat may be divided into three classes: (1) that in which dry hot air is employed, (2) that in which hot moist air is used, and (3) that in which steam is the disinfecting agent. In the disinfection of mattresses, feather beds, etc., where great penetrating power is required, dry hot air cannot be relied upon. In addition to this, there is another objection to the use of this agent, — that, when the temperature is sufficiently high to act as a disinfectant, certain articles are permanently injured by it. The committee expresses its conviction that the use of steam, and especially when superheated or under pressure, is the most efficient agent for the destruction of all sorts of infectious material. At the Boston quarantine station, Dr. S. H. Durgin, president of the Boston board of health, and a member of the committee, has been employing moist heat for disinfecting purposes since the spring of

1885. The disinfecting-chamber is a room ten by twelve feet, and seven feet high. It is made fairly tight, and has one window, on which is a thermometer so arranged as to be read from the outside. A hole two inches in diameter in the door admits a rubber hose, which discharges superheated steam from a boiler on a steamboat. The temperature of the room can by this means be raised in seven minutes to 230° F. It may easily be raised to 250° F. or more, but is generally brought to 230° F., and maintained at that point for twenty minutes. The articles to be disinfected are hung about the room loosely, and when removed, which is done as soon as the heat will permit, are found to be perfectly dry, not even the polish on freshly laundered shirts being damaged or changed. Boots, trunks, valises, and all other articles made of leather, are quickly destroyed by the high temperature, and should not be subjected to this process. Wood-work and paint are also damaged, and articles which are joined by cement fall apart. This process can be quickly applied, easily managed, and is without appreciable cost. Its trustworthiness as a disinfectant has already been established. Dr. Durgin describes the experience of the Boston board of health with the disinfection of rags in bales by means of superheated steam admitted to the interior of the bales through perforated hollow screws. In the first trial of this method a pyrometer indicated the temperature of the steam after it escaped from the bale to be 300° F. Bacteriologists had already shown that disease-germs of the greatest resisting power had been sterilized within the bale of rags which passed through this process. The evidence seemed sufficient to establish the claim that this process was effectual in its power to disinfect bales of rags. Subsequent tests showed that the rags might be intensely hot in one place, while in another they were perfectly cold. In one of these trials the moist heat used was at 300° F., and the time of exposure was four minutes. In some parts of the bales, after being removed from the steam-boxes, the intense heat could not be borne by the hand a moment, while at other points the rags were found to be cold. A still further test was made with steam at 500° F., and the time of exposure increased to eight minutes. Three bales were examined after being thus treated, and the cold places were found as before. Dr. Durgin was informed by the overseer of the process that a large number of bales had been set on fire by this intense heat, and that water had been required to extinguish them. The conclusions drawn by Dr. Durgin from these experiments are that the moist heat passing from the centre to the surface of a bale of rags must encounter knots or bunches of rags varying in degrees of density and of resistance to the penetration of heat; that while the temperature of the principal part of the bale is raised to a degree far above what is required for disinfection, other parts of the bale are found to be wholly unaffected by the heat. That anthrax bacilli have been killed and metals melted at 240° F. within bales of rags subjected to this process are facts not inconsistent with the experiences in Boston, and do not prove the disinfection of the whole bale. The degree of heat, the amount of pressure, and the time necessary for moist heat to penetrate and raise the temperature of *all* parts of a bale of rags to a degree necessary for disinfection without burning the rags, have not yet been declared.

Ethik als Grundwissenschaft der Pädagogik: ein Lehrbuch für Seminaristen, Studierende und Lehrer. Von Dr. MAX JAHN. Leipzig, 1887.

BOTH theoretically and practically the two foundation-stones of a system of education are psychology and ethics, — the one to set forth the nature of the mental activities, the other to expound the actual and ideal tendencies of human action. The systems of education that are prominent in its history derive an important characteristic from the kind and amount of attention they give to one or other of these underlying sciences. The history of educational methods similarly shows a recognition of this twofold origin in all stages: it may be as the education of the State or of the army, and that of the Church or the home. To-day our education has taken on a scientific tone: this advance was conditioned upon the scientific development of psychology and ethics. Any system of education that shall have the slightest chance of gaining a hearing in the future must take full account of the modern aspects of psychology

and ethics; and any teacher anxious to command success must have within himself the power to healthily unfold these two sides of human character.

Dr. Jahn's handbook is intended to present a convenient sketch of the natural basis of a moral education. It is an excellent example of the useful kind of a book which a German teacher can produce. It is admirable as much for what it does not do as for what it does. The danger in all such books is to deal in meaningless generalities, to drift into long casuistical discussions, to neglect the important moral aspect of little habits, and in general urging the teacher to present to the child an ideal from which its healthy instincts revolt as from something artificial and pitiable.

The first section treats of the self-regarding and the social instincts and feelings. These furnish the material upon which a moral education is to be built. They present themselves in the earliest days of life; they are the deepest elements in human nature; a child in whom they are weak is defective quite as much as one born without eyes. The development of these instincts is the beginning of a moral education. That is essentially a wrong method that allows the child to act as whim directs, excusing it on the ground of ignorance, and then suddenly deciding to begin its moral training, and subjecting it to an internal revolution, — quite as wrong as that other current method that begins at once to appeal to the child with high motives and far-reaching theoretical considerations, and is satisfied with the consciousness that the child is learning what is the *maximum bonum*, while constantly neglecting to exercise the little virtues. A moral training that keeps pace with the emotional susceptibilities as founded upon the growth of mind and body utilizes each element when it is at its best, and produces that firm tissue in which morality is embedded as a habit.

Passing from the consideration of morality as conditioned upon the psycho-physical organism, the main ethical conceptions and ideas that inspire the acts of mankind are described, ingenious distinctions are drawn, and suggestive hints are given, which any good teacher can illustrate and enlarge upon for himself.

It is not sufficient to feel what is right or to know what is good: the deep emotion and the high ideal find their true purpose in action. Weakness of will is a greater source of crime than lack of sympathy. That breach between knowing and doing — which Socrates could scarcely realize — is to-day a widely current source of break-down. The will needs to be trained by action: the daily occasions which call for the exercise of emotional kindness must find to hand a habit that does them without effort. Thus the will-power is left free for the larger occasions of life, on the same principle that allows us to walk and talk at once, because our automaton does the former, leaving the higher centres free for mental work.

The moral will realizes itself in the social government and customs of families, of tribes, of nations. The altruistic feelings here find an appropriate field of action, and the good man becomes a good father and a good citizen. The relations of life are diverse, but a common idea of final good runs through them all. Again: these relations are the result of a development; they are connected with a history which explains their defects, and shows the dear price paid for their virtues. It is in this way that Dr. Jahn understands the educational function of ethics. What is new about it is more in the spirit in which the position is upheld, and in the order and proportion in which the several points are emphasized. It is a book well adapted to present needs, and will doubtless find wide use in Germany. Would that we could substitute some such work as this for the dry compends of mental and moral science that we put in the hands of normal-school students.

NOTES AND NEWS.

AT the last session of Congress a considerable sum was appropriated for the purpose of the establishment of several stations throughout the country for the distribution of fish by the United States Fish Commission, similar to the central station situated in Washington. The law provided that these stations should only be established in places where sufficient protection is afforded by law to the fisheries. For the purpose of investigating these conditions, and of making some observations relative to the propagation and distribution of young fish, Col. M. McDonald of the commission

will make an extended trip through the North-west. He will visit Denver, and will probably establish there a station for the breeding of trout, then proceeding to the Columbia River, where he will investigate the nature of the protection afforded by the State of Oregon and Washington Territory to its fisheries. If his investigations are satisfactory, he will take immediate steps toward the establishment of several propagating and distributing stations along this river.

— The following schedule shows the location of the vessels of the United States Coast Survey and the officers ordered to them: the 'Bache' and the 'Eagre' are continuing the hydrographic work on the approaches to Vineyard Sound, Mass.; naval cadets G. R. Evans and H. A. Bispham have been ordered to the 'Eagre'; naval cadet G. R. Slocum and ensign J. H. Oliver have been assigned to the 'McArthur,' now working off the coast of Washington Territory; naval cadets C. S. Stansworth and J. E. Shindel have been ordered to the 'Blake,' Long Island Sound; ensigns W. B. Fletcher and M. Johnson, and naval cadet Joseph Strauss, have been detached from the 'Endeavor,' and ordered to the 'Gedney' off the coast of Maine; naval cadet Robert L. Russell has been assigned to the 'Scorcesby' on the coast of North Carolina; Lieut.-Commander W. H. Brownson, United States hydrographic inspector, is now in Portsmouth, inspecting the new launch building at that place for the Coast Survey.

— The increasing interest which is felt in anthropological science is shown by the number of treatises now in course of preparation by eminent writers on different branches of this science. The Marquis of Nadaillac has in hand a work to be entitled 'Mœurs et Monuments des Temps Préhistoriques.' Professor de Quatrefages is busy with the second part of his 'Introduction to the Study of the Human Races.' This will be followed by a volume on the black

tions at Washington is due to the deceased, who devoted most of his time and work to their study. His numerous writings on American archæology, contained in the annual reports of the Smithsonian Institution and in foreign and American journals, and his recent work, 'Prehistoric Fishing in Europe and North America,' will always be appreciated by scientists, and secure him a prominent place among American archæologists.

LETTERS TO THE EDITOR.

*** The attention of scientific men is called to the advantages of the correspondence columns of SCIENCE for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.*

The editor will be glad to publish any queries consonant with the character of the journal.

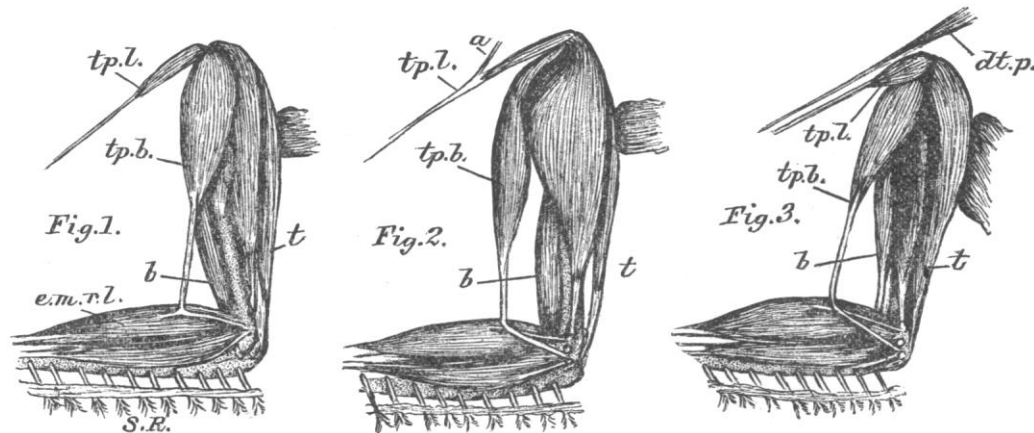
Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

The Dermo-Tensor Patagii Muscle.

CIRCUMSTANCES over which I had no control were responsible for my forwarding recently the wrong drawings which appeared in my letter to *Science* last month (No. 229). Although the essential part of my communication was perfectly correct, I did not intend to have the patagial muscles in the wing of a toucan stand for those structures in the wing of a passerine bird.

If you will kindly reproduce the three figures I here send you, the matter will be made quite clear.

The lettering of these figures remains the same as in those of my first communication upon this subject. In Fig. 1, we have Garrod's representation of the patagial muscles in the wing of a picarian bird (*Rhamphastos*), wherein the tensor patagii longus is found



in the clamatorial birds (*tp. l.*). Fig. 2 is my copy of this anatomist's wing-muscles in a typical passerine bird (*Icterus vulgaris*), and *a* is the stump of the tendon I referred to in my letter in No. 229: it is just possible that it may be intended for the tendon of the dermo-tensor patagii. Lastly, in Fig. 3, I give my own dissection of the patagial muscles in the wing of a typical passerine bird, where *dt. p.* directs attention to the muscle in question. My original description of it in *Science* is correct in all particulars; and the points in regard to it to be briefly noted are, that Garrod apparently overlooked it, and failed to recognize its taxonomical value; that it is characteristic of the true *Passeres*; that it is absent in the *Passeres mesomyodi*, but present in such a form as *Ampelis*, and again absent in the *Caprimulgi*, *Trochili*, and *Cypseli*. To this extent it is an important morphological character.

R. W. SHUFELDT.

Fort Wingate, N.Mex., July 8.

— A geological survey has recently been established in the State of Arkansas, and Mr. John C. Branner has been appointed director. The prime object of the Legislature was to develop the economic resources of the State; and no provision has been made for work in botany or zoölogy. The annual appropriation is ten thousand dollars.

— Oliver P. Jenkins, M.A., M.S., professor of biology in De Pauw University, and Barton W. Evermann, M.S., professor of natural science in the Indiana State Normal School, have gone to Guaymas, Mex., on a zoölogical collecting-trip for the museums of De Pauw University, the Indiana State Normal School, and the Indiana University.

— Dr. Charles Rau, curator of the archæological department of the National Museum at Washington, died a few days ago at Philadelphia. The excellent arrangement of the large prehistoric collec-

tion at Washington is due to the deceased, who devoted most of his time and work to their study. His numerous writings on American archæology, contained in the annual reports of the Smithsonian Institution and in foreign and American journals, and his recent work, 'Prehistoric Fishing in Europe and North America,' will always be appreciated by scientists, and secure him a prominent place among American archæologists.

Mean Heights and Body Temperatures of the Eskimo in Hudson Strait.

WITHIN forty miles of North Bluff, Hudson Strait, I should estimate there were sixty families. On such as visited our station, I carried out my determination of their heights; and, by several references to a family who resided alongside of us, I obtained the

temperatures. At first it had been my intention to have made this determination of temperature in the same general way as the other; but, with my indifferent command of the language, at the beginning of the investigation I had the greatest difficulty in making my subjects understand that the operation would result in no bodily harm, which I had no difficulty in understanding they anticipated, by the perspiration oozing from every pore, a look of piteous agony in their faces, and eyes fearfully watching for the first suspicious movement on my part. I naturally concluded that much misery would be saved, without in any way affecting the accuracy of the result, by determination from the individual rather than the mass. The determination was made by placing the bulb of a thermometer well underneath the tongue, and keeping the mouth closed till the mercury column reached its highest and stationary point.

Our mean temperatures were 98.1° F. for winter (December), and 97.7° for summer (July), whilst theirs were 100.2° and 98.4° respectively. I cannot help thinking that part of this large difference is owing to our Eskimo having changed his diet, by the rations we allowed him, towards the summer season.

In determining the mean heights, I considered it advisable to exclude palpable extremes, as my measurements were necessarily from a limited field. The result was a mean height for the men of 5 feet 3.9 inches; for the women, within a very small fraction of 5 feet.

W. A. ASHE.

The Observatory, Quebec, July 18.

Chrome considered as a Poison.

IN *Science* (viii. p. 178) is printed an extract from a paper written by Dr. Charles Harrington, and which appeared in the *Boston Medical and Surgical Journal* (cxv. No. 6). Dr. Harrington's paper was an original communication made to the Massachusetts Medical Society, and was read at the annual meeting of June, 1886. The society recommended the paper for publication. It thus appears with the indorsement of two journals and one medical society, all of the very first standing and ability.

This paper concerns itself with chromium considered as a poison to the animal body, and cites four cases, all of whom were Dr. Harrington's patients: 1st, A woman who made caps from blue cloth. She was attacked by ulceration over most of the body, with swellings, and with constitutional disturbances which had not subsided at the end of two years. The cloth proved to contain a "large amount of chromium." To dust arising from it the symptoms are assigned. 2d, The case of a clergyman whose hands ulcerated. His gloves proved to contain "a large amount of chromium," and to this the ulcers are attributed. 3d and 4th, Two young boys who were attacked with nausea, vomiting, fever, delirium, and convulsions. Their new suits of clothing were examined, and proved to contain "chromium in great abundance." The paper states that its compounds, when taken internally, produce symptoms similar to those described. One child sucked his fingers, and the other bit his nails. And thus the chrome-poison was introduced. The dejecta from the elder of the boys proved to contain "traces of chromium, and thus established the diagnosis of poisoning."

The well-written and highly indorsed paper, curiously enough, does not offer the slightest evidence that chromium or any of its compounds, in any quantity, however large or small, can injuriously affect the animal body. Furthermore, there is no reliable tradition or literature to that effect. And yet chrome-dyes have been in general use since 1828 at least, the American consumption alone being thousands of tons annually. In fact, so general is their use, that chromic oxide may be found in almost any piece of cloth which may happen to be at hand.

In the entire absence of any reliable literature pertinent, I was led to make studies as to the poisonous effects of chrome-salts. In the weaving of fabrics, the yarn suffers a constant succession of shocks and scrapings, which must detach any thing like dust which may adhere to it. If, then, dust from chrome-dyed yarn had any poisonous effects, weavers ought to have some knowledge of it. Inquiries were set afoot in three mills in Philadelphia, and from none was there reported any injurious effect from such dust. If any

existed, it was not known to the weavers. This seemed important.

Similarly, and in the same way, dyers were questioned, and none of them had any knowledge of injury from chrome. Such operatives have their hands and arms in chrome-dyes at almost any hour of the day, and therefore their replies seemed interesting.

Of even more importance are the workers in a chrome-factory, one which has been in operation over fifty years. Here are produced the alkali bichromates which dyers use. The operatives (some hundreds in number) live in an atmosphere quite heavily charged with alkali chromate dust, visibly charged. Yet these people are as healthy as those in other occupations. As a matter of fact, there may any day be seen at this factory several pensioners, worn out in the service, and now too old to do more than the semblance of labor.

But this is to be said, every man who works exclusively within the factory has the nasal septum partially destroyed in from eight to twenty weeks. The cautery then ceases, and there is no further inconvenience. And, further, if strong chrome-liquors, or much chrome-dust, be allowed to get upon any abrasion of the skin, they are apt to produce sores; and, if these sores be treated to more chrome, they will continue to suppurate, and will produce sores with vertical walls, having the appearance of syphilitic chancres; but if a sore be protected by salve, or otherwise, it heals like any other one would.

Through the courtesy of a practising physician, the health of these bichromate-makers was discussed at a meeting of a medical society whose members had the care of them. No chrome-disease or chrome-poisoning was known to those physicians.

To sum up so far: there is not known to exist, among the workers in any of the forms of chrome, any chrome-disease or chrome-poisoning from contact, from inhalation, or otherwise. This much established, there was no risk in the following experiments:—

1. Three healthy men were exposed for four hours to an atmosphere containing vapors from boiling sodium bichromate,—vapors visible in a beam of sunlight.
2. Two healthy men were exposed twenty minutes to an atmosphere containing visible clouds of dust of neutral sodium chromate.
3. The lower half of a shirt-sleeve was saturated with a ten-percent solution of potash bichromate, and then bound around the arm from wrist to elbow. It remained thus in contact with the skin three hours, and was kept moist.
4. A piece of white cotton cloth was dyed black in the ordinary way, by sumac, iron nitrate, chrome, and logwood. After washing in cold water alone, and passing through a clothes-wringer, a piece of it, eight inches wide and ten inches long, was pinned to the inner side of the undershirt, and worn in contact with the skin for four hours on a hot day.

No experiments were made to ascertain the effects of wearing chrome-dyed clothing, only because the writer was able to recall precisely the cases of so many men, women, and children who had done that without any deleterious results, so far as known. None of them, at least, were affected in any of the manners described as due to chrome-poisoning, in Dr. Harrington's communication. No unpleasant results followed any of the experiments mentioned. No one of the subjects has suffered in the slightest. The time elapsed is more than a month.

In the daily papers of July 12 of this year, appeared the report of a coroner's jury which considered the cases of several persons who died in Philadelphia during the years 1885, 1886, and 1887, from eating buns, it was supposed, made by Palmer, a baker, who had put into them chrome-yellow. The ages of the victims were from three years to twenty-four years, among them being seven of Palmer's own family. He did not deny having put lead chromate in the buns. It was, indeed, in evidence that eighty per cent of Philadelphia bakers so used it. The testimony of Dr. Stein, Dr. Stewart, and Dr. Stark, the attending physicians upon the particular subjects under consideration, was that the symptoms were those of lead-poisoning, and that they set about to search for the source. They found it in Palmer's bakery,—the lead chromate which he put in the buns. The viscera of victims, after death, were submitted to Dr. Leffman,

the chemist, who found lead in them, and testified that the subjects died of lead-poisoning. The newspaper reports say, "The evidence was conclusive that several members of the Diebel and Palmer families died of lead-poisoning." The verdict of the jury was, that "the deaths of the four persons were undoubtedly due to chronic lead-poisoning, and that the poisoning resulted from the use of chromate of lead as a coloring-matter in buns and other bread-stuffs." The only allusion to chrome-salts in the entire reports, as given in two newspapers, was made by Dr. Leffman, who said, "The traces of chromium had disappeared." We have here four cases well authenticated, in which lead chromate produced death,—produced it by chronic lead-poisoning, and not by any action of the chromium trioxide present.

The theory of antidotes, as understood by this writer, is that substances insoluble in any of the juices of the animal body are harmless as poisons. If we do not accept this as a fundamental proposition, it is difficult to see how we reasonably can employ any antidote supposed to act upon that principle. Chromic acid is a very active oxidizer. In contact with organic matter, it is quickly reduced to chromic oxide (a compound insoluble in any of the juices of the animal body). It is a destroyer of organic tissues, therefore. The action of both normal and acid alkali chromates is similar to chromic acid. They destroy organic matter by oxidizing it, chromic oxide being precipitated. Chromic acid and soluble chromates are then poisonous in the same sense as are sulphuric acid and nitric acid. Chromic oxide is harmless.

Concerning the Philadelphia cases mentioned, the writer cannot even pretend to speak with any authority. Any one, however, familiar with the oxidizing action of chromic-acid salts, and who is accustomed to making combustions with lead chromate, would not find much difficulty in believing that the small quantity of lead chromate taken by any one victim was reduced while in contact with organic matter in the stomach and intestines, chromic oxide passing out with the dejecta, and lead oxide being left to produce its cumulative poisonous effects.

When one states that the insoluble modifications of chromium are in any way poisonous to the animal body, the burden of proof rests upon him. The soluble salts (the alkali chromates) do, however, produce sores and sloughing under certain conditions: (1) if they fall in quantities upon an abrasion of the skin, or (2) upon the delicate mucous membrane. Speaking generally, a solution containing 150 grams of an alkali chromate in one litre of water is scarcely strong enough to produce sores upon the hands. Again, generally, alkali chromate dust which is just visible without direct sunlight is harmless, unless one should remain in it for some weeks. When such dust falls upon the mucous membrane, it is quickly reduced by the secretion it finds there, and chromic oxide is precipitated. The membrane is not attacked. There can be no doubt that Dr. Harrington found in the clothing he examined, the large quantities of chromium salts mentioned by him. It would have been rather strange if he had not, since most cloth is chrome-dyed, and contains about eight-tenths of one per cent chromic oxide in its fibre. Had he examined further, equally certain, he would have found iron, cellulose, keratin, and some other organic products. Why not assign to one or all of them the maladies of the patients mentioned? So far as his paper gives evidence, or so far as I know, cellulose is equally as poisonous as the insoluble chrome-dye on yarn. We should risk little in saying this is true so far as any one knows. Before we say otherwise, we should offer such proofs as would lead a cautious man to accept the statements.

To those who read the communication alluded to, it may be of interest to know that a suit of clothing for a small boy will lose in weight about three hundred and forty milligrams in a week. Of this, about eight-tenths of one per cent is chromic oxide, when the clothing is chrome-dyed. Such clothing then loses about two and seven-tenths milligrams of chromic oxide in one week. How much of this latter the boy would be likely to inhale as dust, and what injury it would do him, are matters about which I have no information to offer. If it were arsenic, and he inhaled the whole of it in one day, and twenty times as much more, it might possibly sicken him.

Five hundred milligrams of the chrome-dyed cotton cloth before mentioned was ground between the teeth of a healthy man, and

slowly swallowed. It produced no effect which could be detected. This cloth contained four milligrams of chromic oxide. Such a small quantity was taken only because of the desire to test the effects of minute quantities. The only inconvenience resulting from an attempt to eat a yard square of such cloth would be in masticating it. Even between strong molars, it is really difficult to grind.

To sum up, finally, the writer has not been able to show that chrome-dye, or indeed any modification of chromium, is in any way poisonous to the human body. The continuation of these studies is left to others better fitted to pursue them, and with the sincere hope that the subject will not be allowed to die of neglect. The matter intimately concerns the general welfare. WM. GLENN.

Baltimore, July 21.

Distillery-Swill as a Food for Milch-Cows.

THE interest in this subject, developed by the recent discussion in *Science*, prompts me to give its readers some additional points of interest. Until within the past four years, the practice of feeding distillery-waste on Long Island was very prevalent. Although the ordinances of the city of Brooklyn have for years forbidden the use of this food, no systematic effort was made to stamp it out previous to the year 1883. At that time it was used very generally in Brooklyn and its suburbs, especially during the winter months. Since then it has been almost entirely discontinued through the efforts of the Health Department.

It is the almost unanimous opinion of cow-keepers who have fed swill and dry feed, that the cows do better without swill; by which they mean that they are healthier and less subject to diseases. This statement is of value, as it is the result of a practical trial extending over several years of time, and under conditions otherwise the same. It is the verdict of a large number of stables where the experiment has been tried by different men. To me, this testimony is conclusive as to the question of this food upon the health of the cows fed upon it. Tuberculosis and pleuro-pneumonia are more prevalent in stables where swill is fed than where 'grains,' meal, and hay are fed. This statement is based upon personal observation, and the testimony of the dairymen themselves.

A word as to the manner of feeding swill. The cows do not take kindly to this food, and must be starved to it, as a rule. Consequently, when it is to be fed, it is necessary to withhold other food, for a time at least. I have rarely seen it mixed with other food, and, in fact, the testimony of milkmen in this vicinity is that it is next to impossible to get cows to eat a mixture of swill and other food, excepting hay. The digestion of cows fed upon swill soon suffers derangements that prevent their eating such other food. Whenever it is fed at all, it is claimed that it must constitute almost the only food,—and thus it was fed in this vicinity,—when fed at all. As all advocates of swill as food for milch-cows seem to make their advocacy rest upon a liberal supply of other food with it, it becomes an important point to determine whether cows will eat hot swill, and cold meal or grain, at the same time. The experience of Long Island dairymen seems to indicate that success in this direction is doubtful, and prejudicial to the supply of milk as well as to the health of cows.

Statements have been made from time to time that distillery-waste contains alcohol and fusel oil, and that these alcohols have a bad effect upon the animals. This is an error. Both alcohol and fusel oil are separated from the waste as completely as possible; and my analyses have failed to reveal more than mere traces of either.

Sensational statements have been made that the tails of cattle fed upon this food atrophy and fall off. This statement is based upon the results of anti-pleuropneumonic inoculation seen in such stables. From the prevalence of pleuro-pneumonia among cattle fed upon this hot feed, the owners have for years resorted to a clumsy method of inoculation, in the tail, with a slice of diseased lung. In a considerable number of cases, septicæmia results, necessitating an amputation of the tail. The loss of the tails has nothing to do with the food.

When cows are kept most of the time in stalls, and fed upon this hot food, they become feverish. The temperature usually ranges from 101.5° F. to 102.5° F. This must be regarded as an

unhealthy temperature, and no cow that has a persistent temperature of 102° F. can give a wholesome milk.

The conditions and methods here set forth are those that almost universally prevailed on Long Island when this food was used; and the milk, which I have analyzed, and which was referred to in previous numbers of this journal, was produced under these conditions.

The chemical features of the milk which are most marked, are, the strongly acid re-action, deficiency of fat and sugar, and great excess of caseine or curd. So marked were these features, that I was able to identify swill-milk produced under these conditions.

That such milk is a dangerous food for young children, I have had abundant clinical evidence. The tough, hard curd produced in the stomach by this milk is entirely too much for the digestive powers of even healthy children, and passes undigested, irritating the intestinal mucous membrane throughout its entire length, giving rise to intestinal catarrh, inflammatory diarrhœa, or cholera-infantum. Occasionally the curd formed in the stomach is too large and firm to pass the pylorus, when the child passes into rapid collapse and death, unable to rid the stomach of the mass either by vomiting or purging. Remedies, under such circumstances, are of no avail. I have seen the same effects, in a somewhat less degree, produced in adults who were not disturbed by a pure, wholesome milk.

I think we may accept it as demonstrated, 1st, that fed as it has always been in this vicinity, distillery-swill is an unfit food for milch-cows, as it deteriorates the health of the cows, and produces unwholesome milk; 2d, from the difficulty of perfectly controlling the manner of feeding, it is not warrantable for any sanitary authority to recommend it as a food for milch-cows; 3d, it has not yet been proven that it can be successfully fed in conjunction with other wholesome food; 4th, the laws now in force in this and other States, forbidding the sale of swill-milk, are justifiable, and should be enforced.

E. H. BARTLEY, M.D.

Brooklyn, July 23.

IN answer to yours of the 13th, I have read the papers and reports on distillery-swill milk published in *Science*, and, in my judgment, you have furnished reasonable evidence of the unwholesomeness of such milk as a general fact. I mean where distillery-swill constitutes the chief food of the animals.

From the very nature of the case, complete proof and absolute demonstration by direct, full, and conclusive experiments cannot be had: so we must rely on such evidence as is available, the same as in so many other sanitary questions where the deductions have to be derived from a great mass of cumulative evidence, each single fact in which is inconclusive. I have therefore only to suggest that you continue the recording of facts as the only available way either of arriving at just conclusions or of convincing the public of the truthfulness of the conclusions.

I know of no conclusion in sanitation so well established that men may not be found to deny it; and, so long as distillery-swill milk does not kill or sicken *all* who may use any of it, there will probably be persons who deny that it is harmful to any.

The correspondent in *Science* of July 22 (p. 46) fails to find "positive evidence" of "any ill effects of swill upon cows fed with it." On the other hand, he asserts, as if on "positive evidence," that "the evils attributable to it are largely, if not entirely, to be ascribed to the unsanitary surroundings of the animals." I hardly know how comprehensive and sweeping he intends this to apply. It would be unfair to charge him with asserting that the almost universal disease in distillery stables, the emaciation, the lax bowels, the loss of teeth, the short lives in such stables as distinguished from those where hay and grain are the chief food, and the "unsanitary surroundings of the animals" in these stables, as a rule, should be merely curious coincidences, and not due to the feeding of the swill itself. His language implies all this, but surely I can hardly believe that to be his meaning.

Some supplementary statements, however, are equally positive and equally striking, — the proposition "that lactation in a dairy is not a normal process," and that he regards the conclusions (if not, indeed, the facts) given by certain chemists and physicians, regarding the nature and digestibility of the curd of swill-milk, as on the whole unworthy of confidence.

If you can convince a few orphan-asylums and foundling-hospitals

that it would be an innocent and harmless experiment to feed half of their children on distillery-swill milk, and the other on grass-and-grain milk, and continue this experiment for several years, on different races of children, in different localities, some of the swill-milk stables to be kept as clean as other stables may be, by some process not yet announced, and carefully record and collate all the results, the question would then be settled, in the usual acceptance of that term.

Until some such plan for "positive evidence" be secured, I suggest that you work at the method of cumulative evidence which has been so rich in conclusions and beneficent in its results in other departments of sanitary science.

WM. H. BREWER.

New Haven, Conn., July 25.

State Interference.

COPIES of *Science* containing two of the articles on State interference have been received; also your note asking opinions respecting them.

I am glad you undertook the investigation, and wish it might have called forth more elaborate replies. It is a subject which ought to be worked up carefully for all the States and for a period of years long enough to show the working of tendencies.

But, so far as the facts you have presented go, I see very little which will not be found upon the statute-books of England, which is generally known as the classic land of *laissez faire*. The protective system involves more serious interference with private concerns than almost any of the new laws. Our legislators, I admit, are ignorant, and moved largely by party or private interest; but that is the fault of our political system, and is connected with the essentially commercial character of the people. The social question is upon us: we must have laws regulating competition to a certain extent. The danger comes, not from the tendency toward such regulation, but from the character of the men to whom legislation is intrusted: hence the necessity of civil-service reform, of higher political education, and of a strengthening of the moral tone of the people.

H. L. OSGOOD.

Short Beach, Conn., July 23.

Tornado Force.

MR. E. B. GARRIATT has a communication on tornado power in your issue of July 22, in which he complains of the "disposition, on the part of writers on scientific subjects, . . . to sacrifice common-sense reasoning and probable facts to profound but improbable theories," and then proceeds to explain tornado energy as due to electricity, and not to wind. To support this view, he makes the statement, first, that "moist air is one of the best known conductors of electricity;" and, second, that the "earth is the great reservoir for the electric fluid." It might be worth the while for Mr. Garriatt to assure himself of the truth of his fundamental principles before he applies them on so large a scale. There is not the slightest experimental evidence that moist air is a conductor at all, much less "one of the best;" and as for the earth being a reservoir of electricity, every thing that is known about electricity negatives the idea.

Again: it is implied that electrical energy is more destructive than other kinds, as if a definite quantity of it could do more work than an equal quantity of other energy. He also speaks of "the electric fluid." These quotations show that he has no practical acquaintance with what physicists call 'electricity;' that he does not understand the laws of its generation, the conditions of its transference, nor its quantitative relation to other forms of energy; and therefore, to quote still further from his article, it is "unsatisfactory and worthless from a practical scientific standpoint."

A. E. DOLBEAR.

College Hill, Mass., July 23.

Answers.

10. ROBIN'S NEST. — The ten-storied robin's nest mentioned in *Science* of July 22 is indeed a remarkable affair. It is rather unusual for robins to build a new nest on an old one, although it sometimes happens. I have seen a number of two-storied nests, and one three-storied one, but such nests are rare.

J. A. ALLEN.

New York, July 26.